Small Business Innovation Research/Small Business Tech Transfer

Condensate Separator for MIcrogravity Conditions (COSMIC), Phase I

Completed Technology Project (2018 - 2019)

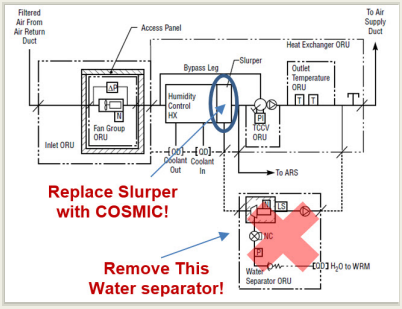
Project Introduction

Paragon Space Development Corporation (Paragon) proposes the development of an advanced COndensate Separator for MIcrogravity Conditions (COSMIC). COSMIC is a full flow condensate separator designed to separate condensate from air effectively and with low power use. This technology employs Paragon's unique and robust, low power liquid separation technology that has heritage in and has been demonstrated as highly effective by Honeywell in the Two-Phase Extended Evaluation in Microgravity (TEEM) flight experiment. This technology satisfies NASA's needs as described in SBIR topic Z2.01; NASA is interested in advanced heat exchangers and coldplates that leverage novel manufacturing techniques to minimize structural mass and provide a good thermal performance, corrosion resistance, a reliable 3-year minimum life not contaminated by microbial growth, and whose coating does not impact the life support water recovery system. COSMIC is intended to replace the Common Cabin Air Assembly (CCAA) slurper and water separator ORU. Currently the ISS CCAA CHX, slurper, and water separator are intended to condense/remove excess moisture from cabin air. Issues arise because slurper behavior is dependent upon a liquid film wetting the CHX and slurper. This behavior requires a hydrophilic surface. The presence of siloxanes on the ISS has degraded the hydrophilic CCAA CHX coating driving surfaces to behave hydrophobically. COSMIC addresses these issues by improving the means of separation so that it may occur independently of surface wetting behavior. COSMIC introduces no additional pressure drop, requires no additional flow, provides head to the separated vapor stream, is potential drop-in hardware, harnesses proven technology in microgravity, and introduces little parasitic power draw. COSMIC is an *independent* technology but may be paired with Paragon's Silver-plated Condensing Heat Exchange for Microgravity Environments (SCHEME) technology.

Anticipated Benefits

Spacecraft thermal management is necessary and COSMIC enables missions by increasing system safety and performance, reducing system mass, and increasing system reliability. These technologies are crucial for conserving cryogenic fluids, maintaining critical life support, and enabling proper thermal control for sensors and instruments used in missions. Target applications include exploration and operations missions to the moon, Mars, Venus and other missions requiring longer durations.

COSMIC can be adapted to a variety of coolants and put to use in space, Naval, Air, and Ground systems with equal effectiveness. Commercial companies like Boeing, Lockheed Martin, and Orbital are key targets as well commercial companies as the COSMIC technology can be used for two-phase separation for any sized coolant loop or used for condensate removal from any system presented with a humid air stream.



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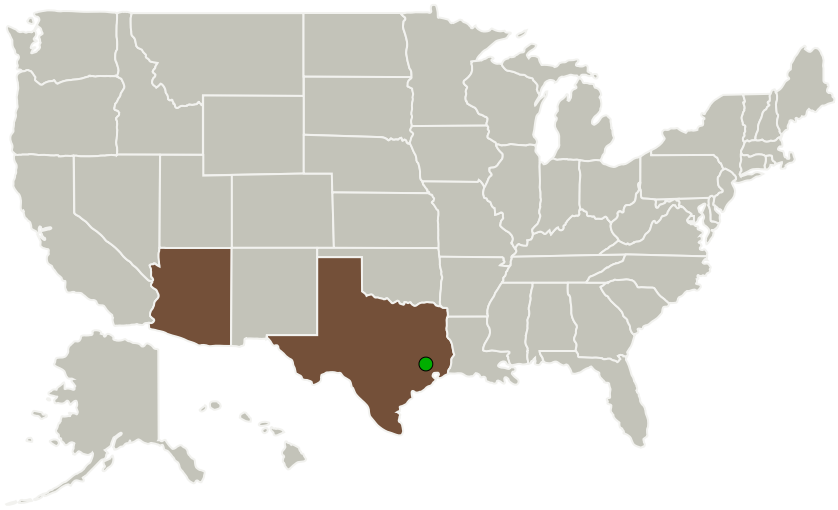
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Paragon Space Development Corporation	Lead Organization	Industry	Tucson, Arizona
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Arizona	Texas

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140985)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Paragon Space Development Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Thomas J Cognata

Co-Investigator:

Thomas J Cognata

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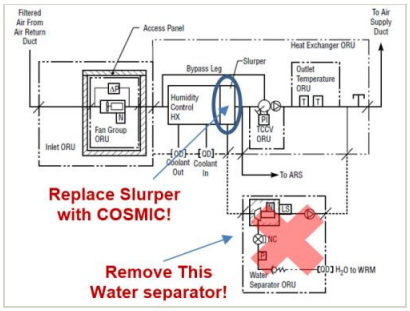
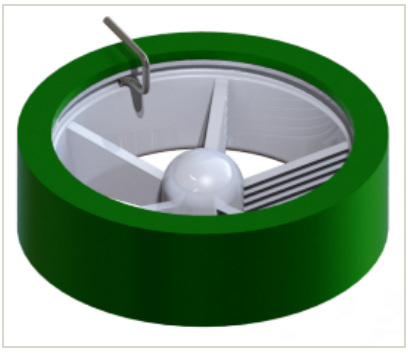
Images



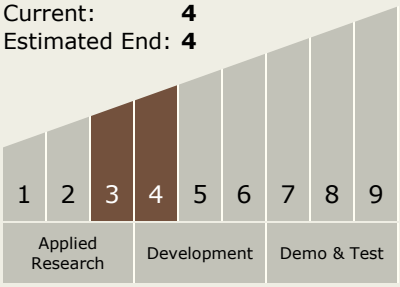
Briefing Chart Image
Condensate Separator for MIcrogravity Conditions (COSMIC), Phase I
(https://techport.nasa.gov/image/129263)



Final Summary Chart Image
Condensate Separator for MIcrogravity Conditions (COSMIC), Phase I
(https://techport.nasa.gov/image/126953)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage

Target Destinations

Earth, The Moon, Mars